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Reflections on Prehistoric Life at Umm an-Nar (Trucial Oman) Based on Faunal Remains from the Third Millennium BC

INTRODUCTION

When the Oman corner of the Arabian Peninsula was opened for archaeological studies in 1958, one of the first places to be visited by investigators was the small island Umm an-Nar of the Trucial Coast lagoon complex (figs. 1 and 2).

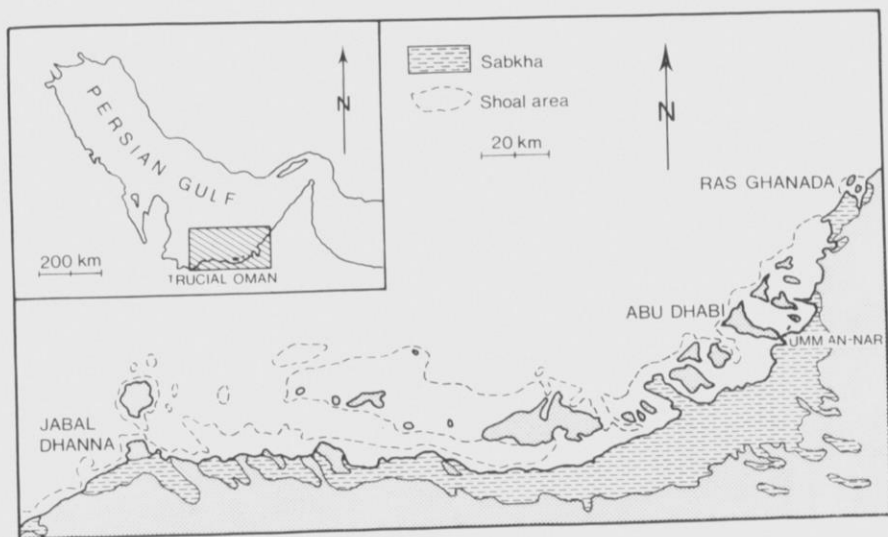


Fig. 1. — Location of Umm an-Nar in the Trucial Coast lagoon and island complex (redrawn from P. Bush 1973: fig. 1).

Closer studies revealed the presence of two main types of ancient architecture on Umm an-Nar (Frifelt 1975a): a) about fifty, originally beehive-shaped grave mounds, skilfully erected

from local limestone blocks, with a ground diameter of between 1.5 and 12 m, were found in various states of decay on the low limestone plateau which makes up the core of the island (fig. 2); and b) remains of a townlike settlement, covering an area of at least 200-300 x 200 sqm, were traced adjacent to a small creek at the northeastern end of the island and facing southeast towards the mainland. Seven of the grave mounds were excavated by Danish archaeologists who were the first to work on

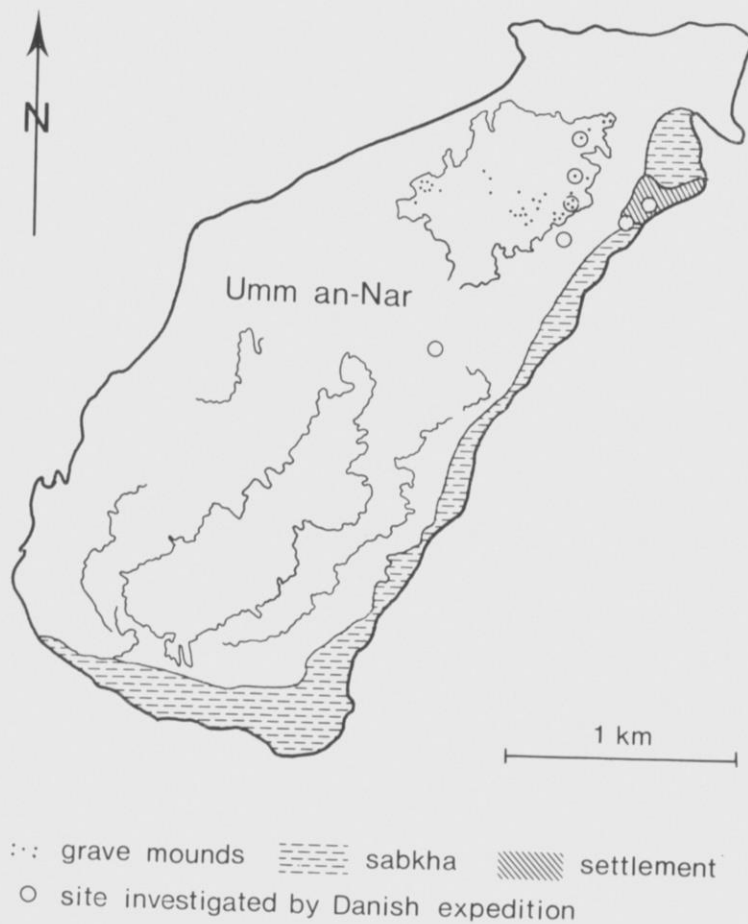


Fig. 2. — Umm an-Nar is a 4.5 km² desert limestone rock of low relief, partly covered by light-coloured, calcite sands. Semi-dry algal flats and *Arthrocnemum* marshes, stretching round its southern margin from its northeastern to its southwestern corner, connect it with the Oman mainland (see fig. 4).

Umm an-Nar. They also partly unearthed three of the town houses, which were comparatively large, square or rectangular buildings, preserved as the basal part of thick limestone walls (for references, see Frifelt, *ibid.*). Here, inside and around the original buildings, faunal remains were found of which a considerable portion was secured and later sent for determination in Copenhagen, Denmark. The present paper gives a survey of this collection of fragments of bones, teeth and shells, which accumulated as household refuse during (part of) the comparatively short span of time in the 3rd millennium BC when the place was inhabited (possibly 200-300 years, and perhaps as far back as 2700 BC, Frifelt, this vol. and 1971). The sites where litter was dumped are supposed to have been abandoned or already ruined houses (Frifelt, pers. comm., 1977).

The bones and teeth to be treated here belong to nine species of mammals (in order of decreasing number of fragments: seacow, dromedary, ox, oryx, gazelle, goat, sheep, and two whale species), five species of birds (cormorant, snake bird, duck, flamingo, and heron), one species of reptiles (turtle), several species of bony fishes, and at least three species of elasmobranchs (shark, sawfish, stingray). The shells derive from molluscs; about fifteen species of marine gastropods and bivalves and one species of cuttlefish have been recognized.

THE ENVIRONMENT

The rather conspicuous degree of fresh fragmentation of the skeletal material as it is now, as well as the encrustation of many of the fragments with minerals (mainly gypsum) indicate the difficulties met by the excavators when they dug out the bones from hardening sabkha formation in the low-lying sandy parts of Umm an-Nar.

The Arabic word *sabkha* has been traditionally applied to salt-encrusted, supratidal, flat land surfaces. Along the Trucial Coast, sabkha stretches from the coast-line 10-20 km inland to be bounded at some places by low hills of consolidated Tertiary sediments (fig. 1). Sabkha, as a geologic term, is an evaporitic facies which typically develops in hot desert environments which, for the coastal sabkhas, lie just above the level

of high spring tides. They may be occasionally inundated. Evaporation from the ground waters, which in the Trucial Coast sabkha are largely replenished from the lagoons, brings about interstitial precipitation of evaporite minerals such as gypsum (Evans, Kinsman and Shearman 1964; Kinsman 1969; Bush 1973).

According to Murray (1977), until about 5000 BC the present lagoon and island complex of the Trucial Coast region was a desert land surface. Around 5000 BC changing sea-level/land surface relations resulted in a gradual flooding of the lower outer parts of the desert area, changing its hills and dunes into islands surrounded by a shallow sea. By about 1800 BC the coast-line was far to the east and south of the present one (fig. 3). After a small oscillation of *c.* 1 m (see below) sea level

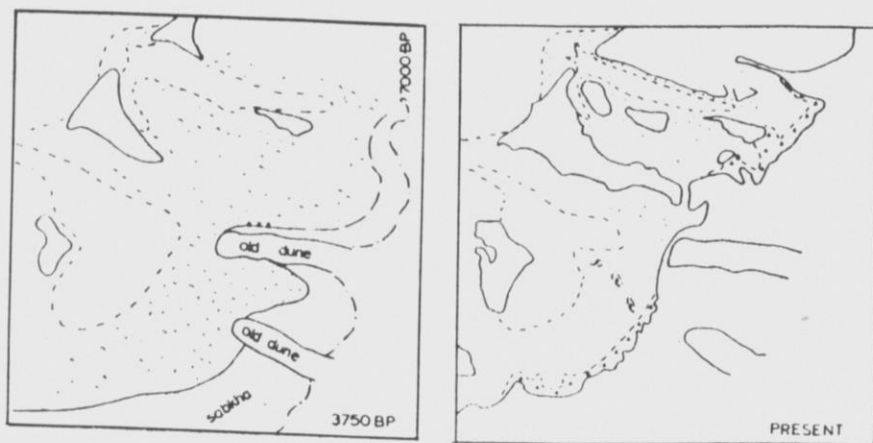


Fig. 3. — Schematic interpretation of the development of the lagoon complex, by John W. Murray (1977: fig. 6).

has remained more or less constant in relation to the mainland surface, but accumulation of sediments (predominantly organic and inorganic calcite sands) in the protected shallow waters behind the fringing islands has caused the inner shoreline to regress seawards at a rate of roughly 1 km per 1000 years, or on average about 1 m per year, thus gradually building up the lagoon complex as we know it now. The evaporite-mineral belt (the sabkha) has been moving progressively seawards as new land formed by the addition of sediments to the shoreline.

As part of this process, sabkha also developed in the lower sedimentary part of Umm an-Nar, including the town base (fig. 2).

Recent investigations in boreholes sunk in the sabkha plain of the mainland have shown that about 2000 BC the lagoon margin southeast of Abu Dhabi island was between 5 and 6 km landward of the present low water mark, and that shortly after a relative fall of sea level by approximately 1 m occurred (Bush 1973). It seems reasonable to believe that Umm an-Nar at the time of its habitation could be reached by seagoing vessels, coming in from the open Persian Gulf through one of the openings to the north and south of the ancient and at that time smaller Abu Dhabi island, and following the lagoonal tidal channel system up to Umm an-Nar. The position of the settlement, supposedly functioning as a port of loading and discharge, appears inconvenient with respect to navigation under modern conditions of water depth. The inner lagoon lobes are shallow, and algal flats which are dry or semi-dry at low tides enclose the island on its leeward side (fig. 4). But 4,000-5,000 years ago, when water level was higher, and sedimentation (thus algal flats) was not so far progressed, ships coming in at high tide could anchor up close to the island, or, most likely, were steered right up to the roads off the town on the leeside. The ancient dhows or reed ships (exemplified by Thor Heyerdahl's 'Tigris') built to carry a considerable number of people and goods over wide, open seas, and to land on beaches due to the lack of artificially deepened harbours, could be supposed not to have drawn more water than was then available.

Whether the later lagoonal development as outlined above, with a gradual closing up of the inner lagoon lobes, contributed to the desertion of the place by man, we cannot say on the basis of the present evidence. Socio-cultural factors may have been more important controls on the abandonment.

At the present time the inner lagoonal environments are hostile to most forms of life, and few plant and animal species live there. The climate in the region is extreme. During the day-time, air temperatures may surpass 40°C, and the mean annual rainfall is less than 4 cm (Bush 1973). Wind from NNW, the shamal, is frequent. Consequently, evaporation from land and water surfaces is high leading to a salt concentration of above 60‰ in the lagoonal backwaters with poor circulation and no

fresh water flow from land. The water temperature may also be markedly elevated (Evans et al. 1973). In the mid-lagoon waters environmental conditions are less extreme, and flora and fauna less depleted in comparison to Persian Gulf biotopes.

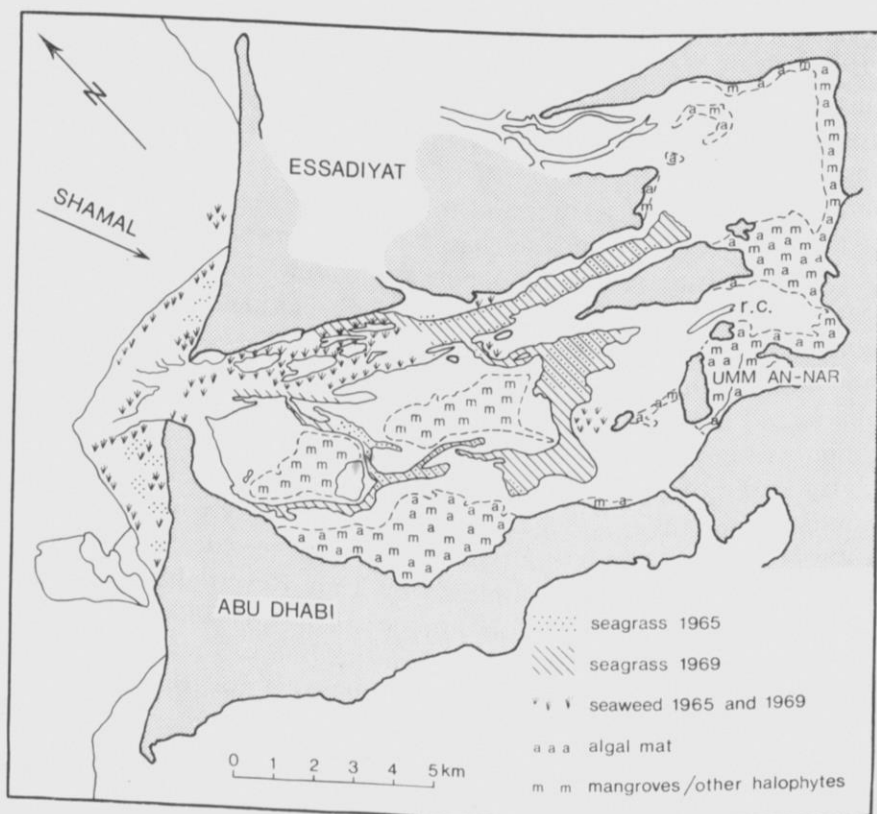


Fig. 4. — Map to show the present lagoon complex around Umm an-Nar. The inner lagoon lobes are rock platforms with a thin veneer of soft sediment, and water-depths commonly less than 2 m. The channels (with seagrass etc.) have depths up to 7.5 m. r.c., relict channel. Blue-green algae form algal mats in protected intertidal zones. (Compiled from Murray 1977, and Evans et al. 1973).

Seagrasses (*Halophila* spp. and others) are restricted to subtidal sedimentary bottoms with water salinity below 50‰, while mangroves (*Avicennia marina* and others) and other halophytes which colonize the upper part of the intertidal zone may tole-

rate more extreme conditions. Fig. 4 shows the distribution of these and other plants and in particular the distribution of seagrasses before and after the initiation of certain modern dredging works at the openings of the Abu Dhabi lagoon which permitted a better circulation of open marine water (Evans et al. 1973). It can be concluded, from this and the other evidence that sea flora and fauna around Umm an-Nar were more prolific in earlier times with greater depths of water and a better water exchange in the vicinity of the island. This environment provides an interesting facet to the background for the Umm an-Nar culture.

GENERAL REMARKS ON THE FAUNAL REMAINS. LIMITATIONS

The geological environment from which the faunal remains were extracted has been favourable for the preservation of only skeletal hardparts, whereas softer organic matter, such as horn, skin, tendon, etc., has totally disintegrated. Sediments (mainly calcium carbonates) and evaporites (mainly calcium sulphates) are rich in Ca-ions, and thus constitute a stable matrix for the bones and shells. The above-mentioned encrustation with evaporitic gypsum seems to be the only chemical fossilization process to have affected the material during its 4.5 millennia history of deposition.

While the original amount of skeletal material discarded by man may not be the same as that preserved today owing to the activities of scavengers, such as vultures, goats, ?dogs and others (few fragments carry marks from biting, but smaller and more fragile bones, e.g. from fish, may have been devoured in entirety when fresh), there is also a bias caused by selection on the part of both the excavators and the subsequent investigator. (Concerning studies on the transition of animal parts from the biosphere into the lithosphere, especially man's interference, see Noe-Nygaard 1977). In the Umm an-Nar case, all bones, teeth, etc. encountered during the excavation of the ruins were collected (pers. comm. Karen Frifelt); but it should be remembered that the excavation included only a small part of the settlement. And not all collected specimens were finally

determined. It is true that almost any fragment of a skeleton can be referred to an animal species, but in practice the osteologist has to limit work to a tolerable length, so a number of fragments with inconspicuous morphologic characters will be put aside as 'undetermined'. Various factors may here give rise to bias in an estimate of initial proportions, e.g. that animal bones are not alike, neither what concerns resistance to physical stress (fragile bones may be underrepresented in the final amount of determined fragments), nor in amount of characters on the basis of which fragments of them can be determined (some bone fragments, which are easily preserved, have few or no significant characters which could refer them to genus or species, while others have many such characters). Also, animals vary in relative proportions of skeletal material. Such difference can even occur between males and females of one species, e.g. in most forms of deer, where the males have antlers and the females have not. Extremes in number of skeletal elements per individual are seen in herrings with hundreds of bones, and snails with a single shell. Among the animals of the present collection, the turtles, which all seem to pertain to one species — the green turtle, *Chelonia mydas* — generally have large bones whose interior is a 'spongy' bone material without larger cavities; these bones are rather easily broken, and are recognizable even in tiny fragments. In contrast, the small ruminants of the collection — goats, sheep and gazelles — possess smaller bones many of which are hollow; as fragments they may only with difficulty (or not at all on the basis of macroscopic characters) be referred to one of these forms. In addition, a process of decay resulting in a continuous peeling of the outer layers typically affects some but not all kinds of bones under certain climatic conditions and may blur the morphologic characters and prevent determination. Therefore, the simple summation of determined fragments in the present study is hardly worthy of more detailed consideration. This explains why the present material has not been subject to a greater number of countings and statistical procedures which could lead to estimates of 'number of eaten fish per inhabitant per year' or equally interesting matters frequently dwelt upon by archaeo-osteologists.

COMPARISON OF UMM AN-NAR WITH OTHER SITES ON THE BASIS
OF THE TWO SPECIES REPRESENTING THE BULK OF THE FAUNAL
REMAINS

Dugong (seacow), *Dugong dugon* (*Halicore dugon*), and green turtle, *Chelonia mydas*, far exceed all other species of the collection in amount of preserved skeletal material. This presumably reflects a habitual practice among the Umm an-Narians in the 3rd millennium BC of killing and utilizing the products of these two forms to a much larger extent than any other larger animal forms, whether wild or domestic. (Concerning the original amount of smaller vertebrates, such as many fishes, estimated on the basis of preserved remains, note the above taphonomic considerations).

At present, dugongs are exceedingly rare in the region. They are becoming (or they already are) exterminated in the Persian Gulf, just as seacows were exterminated by man during early historical times in the Mediterranean, and in the 18th century in the Bering Sea (the Arctic Steller's seacow). A similar fate is threatening the Atlantic seacow, the manatee. As large and slow-breeding, purely herbivorous, marine mammals they are highly sensitive to man's destructive activities in the environment, such as his hunting them at random and in great numbers or his contamination of the seawater close to sheltered beaches favoured by dugongs thus leading to a decay of their food plants. Accounts of living dugongs being loaded on railway carriages to be taken as fresh meat to Sri Lankan inland markets illustrate their situation (Bertram and Bertram 1968). At present, however, Australian legislation provides legal protection for dugongs apart from traditional aboriginal seacow hunting (Heinsohn 1972. Unfortunately great numbers of them become entangled in shark nets put up along the beaches, and drown).

Turtles are still found in the Trucial Coast lagoons. Their presence may only be a question of time — or of effective protective legislation! One sign of man's dietary interest in them is the vernacular name meaning soup turtle used for them even in distant northwest European countries as Denmark where turtles hardly ever occur alive.

Kitchen middens scattered along the coasts of the Red Sea,

the Indian Ocean and the tropical and subtropical western Pacific reveal by their large contents of dugong and turtle remains that these two animal forms have constituted the major hunting objects for people in small local societies from ancient times right up to the present day (Jarman 1966). So in this respect Umm an-Nar was not unique.

THE DUGONG (fig. 6)

The adult dugong is a heavy, 2-3 m long, spindle-shaped mammal with flipper-like forelimbs, no hindlimbs and large transverse tail flukes (fig. 5). Out of water, dugongs are totally

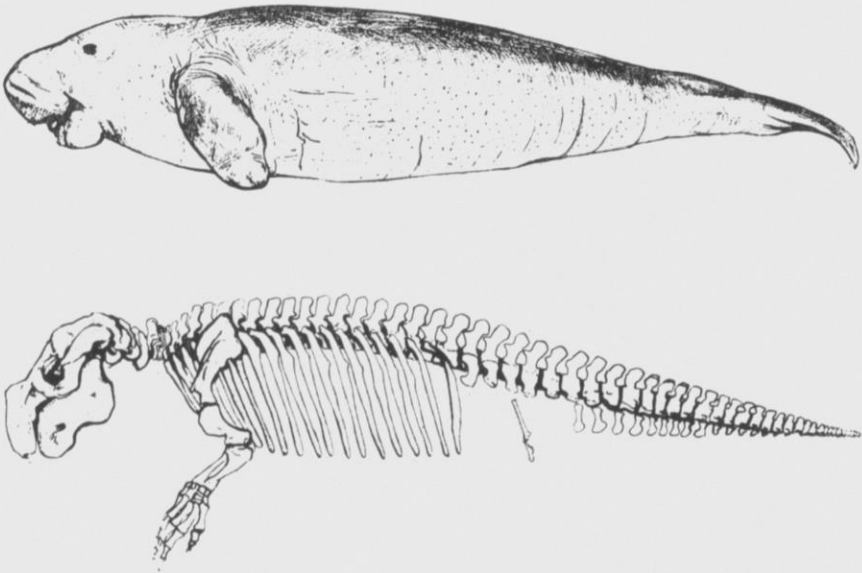


Fig. 5. — *Dugong dugon*, the Indo-Pacific sirenian which is thought to have given rise to the myth about the mermaid. (Drawing by Jonathan Kingdon, published in Kingdon 1971: 392).

helpless. In water, they are described as being shy and peaceful creatures, defenceless when chased by man and little aggressive even in intrasexual confrontations (Jarman 1966). They feed mainly or exclusively on various species of seagrass (*Halophila* spp. and others, Kingdon 1971:394) on which they graze under water, solitary or in flocks, as they move slowly over the bottom

of the shallow seas behind sheltering reefs and islands. They may feed in deeper waters, but they fear open coasts when water is rough and they might become thrown onto the reefs or beaches and killed. The Trucial Coast lagoons, and the lagoon around Umm an-Nar under our special attention, sheltered from the shamal, but more open in the 3rd millennium BC than now and with more extended submarine seagrass meadows due to the better water circulation, must have been a luxuriant dugong habitat.

The dugong's acute hearing and rather good sense of smell make it difficult to approach. Dugong may be caught in nets,



Fig. 6. — *Dugong dugon* 1. Thoracal vertebra, frontal view. The fracture shows the spongiosa filling up the interior of the vertebral body. 2. Right scapula, fragment of proximal part. 3. Tusk, worn distally into a facet. 4-7. Ribs. Distal fracture of largest rib (7) shows the almost compact interior bone material. 8. Left periotic bulla, in ventral view. (Black square indicates 1 cm²).

e.g. stretched across their routes. Along the East African coast they are traditionally hunted with harpoons (Jarman 1966). Besides meat, the dugong body can provide the hunter with leather and oil, the latter being extracted from a particular part of the skin and from other special regions of the animal; the skin can also be boiled for glue (Bertram and Bertram 1968). A seacow of 300 kg can yield more than 50 litres of oil (Kingdon 1971) used for man's exterior and interior needs (as skin lotion, medicine, cooking grease, etc., Bertram and Bertram 1968). Presumably, the ancient Umm an-Narians knew of dugong oil and the other products which could be obtained from these animals, although no traces of such perishable materials have been found. In all probability, dugong products were regarded as daily necessities which could also serve as objects for exchange with foreigners coming to the island, to be given for cereals, animals or hardware such as carnelian and ceramics, specimens of which have been found during the archaeological excavations.

The phylogenetic relationship of dugongs with elephants is reflected in, among other characters, the two upper incisors developed as tusks. They are present in both sexes, but erupt only in adult and old males where they project a few centimetres from the large, down-turned premaxillary bones (fig. 5), and become worn at the ends, presumably through the action of sand sticking to the seagrass plants which they eat (Kingdon 1971). Tusks with facets of wear, when found detached from the jaws in ancient kitchen middens, may arouse a false association in the mind of those trained in looking for ancient handiwork. But they are not man-made tools. Judging from the number of them found among the discarded bones on Umm an-Nar, dugong tusks may not have been used much as raw materials, either for the fabrication of tools or for objects of art. This appears surprising when compared with the multiple and widespread uses of elephantine ivory (from elephant and mammoth), or of tusks and large teeth of other marine mammals, such as the walrus, narwhal and sperm whale. Walrus tusks in the 14th century were shipped from Norseman settlements in western Greenland via Iceland and Bergen in Norway to be sold in Flanders as walrus ivory (Møhl 1974); such laborious effort illustrates the value of the material. The dugong

tusks preserved among the remains from Umm an-Nar are now brittle, and would be worthless for carving. It may be that their natural flexibility decreased in the hot, dry climate rather rapidly after they were removed from their original moist environment in the jaws of the living animal, and this may explain why they were discarded. In Indonesia, where the climate is different, dugong tusks were thought to render their owner invulnerable and they have been utilized as ivory (Kingdon 1971).

The dugong bones of the collection represent all the skeletal parts of the animal, and are from both larger and smaller individuals. Bones from larger individuals predominate. In most cases, dugong bone fragments are easy to recognize due to their morphology and ponderosity. Apart from the vertebral centra, most dugong bones are noticeably heavy and compact in bone material, particularly the ribs which may furthermore have a swollen appearance. (The term pachyostosis, often used for ponderosity, should be abandoned since it signifies a pathogenic state, Spillmann 1959). Ponderosity has been regarded as a specialization to underwater life. In the newborn seacalf, the bones are similar in structure to those of land mammals, i.e. they possess interior marrow cavities with spongiosa. During the period of sucking, the young animals spend most of their time floating near the water surface. Later, when turning to seagrass food, and with the lungs being adapted for longer stays under water (adult dugongs may remain submerged for about 10 minutes), they become heavier during a rather short span of time by the addition of bone material to the exterior and interior surfaces of many skeletal elements. This may be seen as an adaptation to passively remaining under water for grazing combined with active swimming to the surface for breathing.

THE GREEN TURTLE (fig. 7)

The collection includes more than 4,000 turtle bone fragments (plus an uncounted number of small bone splinters) which indicate a considerable variation of the size of the individual animals, the larger ones being forms with carapaces up to 110-120 cm in length. The majority of the fragments derive

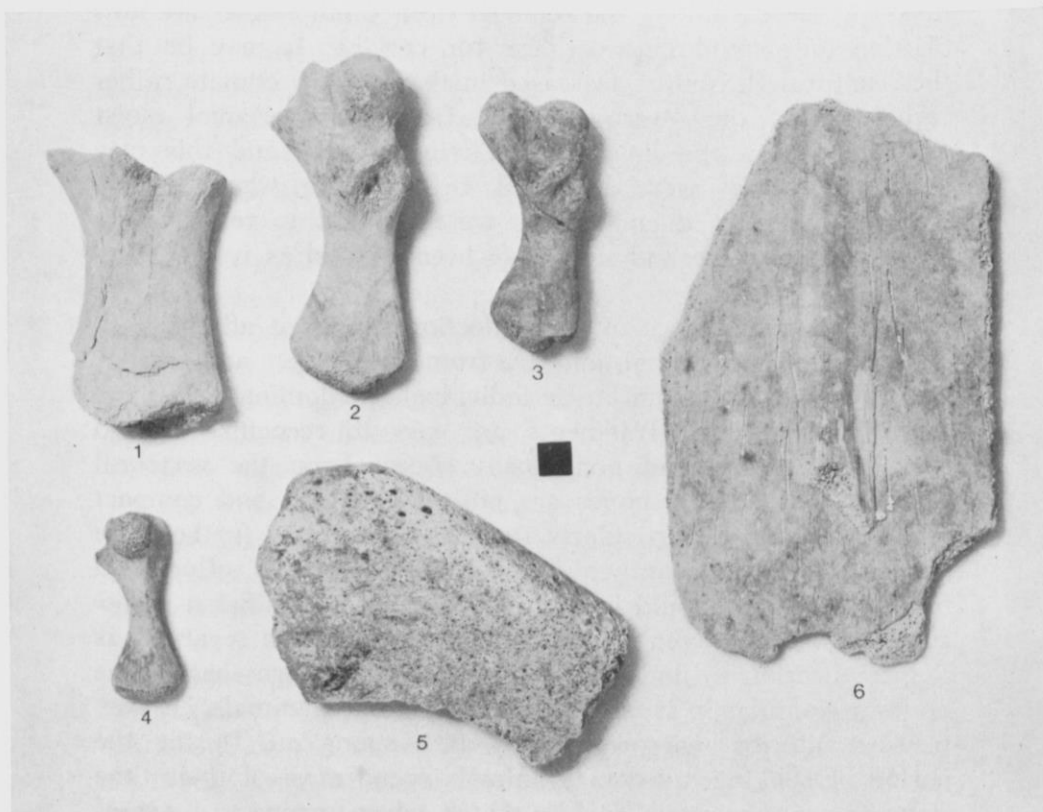


Fig. 7. — *Chelonia mydas* 1-3. Left humeri (1: lacking proximal and distal ends), showing variation in size of individuals. 4. Left femur of young individual. 5. Right anterior marginal plate of carapace of a large individual (length of carapace c. 115 cm). 6. Coastal plate seen from below. Part of a co-ossified rib is seen along the middle of the plate. (Black square indicates 1 cm²).

from the shell. These bones are dermal formations partially co-ossified with endoskeletal elements of the trunk region. A great number of proximal limb bones (humeri, femora) are also present, together with a certain number of more distal limb elements. However, there is a remarkable lack of cranial bones, although the skull in green turtles is well ossified. The explanation appears to be cultural rather than osteological: traditional turtle fishermen cut off the head of the captured animal on the spot (in contrast to tortoises, turtles cannot completely withdraw their head within the shell) in order to prevent

damage to man or boat. The horn beak of turtles is sharp and powerful, and the turtle knows how to use it.

Green turtles, when adult, are predominantly vegetarians (the young forms are carnivorous, Bustard 1972:24). They also take animal food when an opportunity offers; jelly fish, for instance, will be munched by them. Their plant diet consists of marine algae and species of angiosperms, largely the same forms as those eaten by dugongs. They may eat leaves of mangrove as is reported from the Galapagos Islands (Bustard 1972). Therefore, green turtles also occur in shallow seas where they may be rather easily caught. The species is (or was) known from all tropical and subtropical seas with suitable feeding grounds. The animals only rarely come ashore. The females, however, have to lay their eggs on land. They seek out sandy places where they beach in great numbers preferably at high tide during the dark hours of the night when the air is cool and predators (monitor-lizard, pig, man and others) are supposed to be absent. Such turtle rookeries are visited year after year.

Stories are numerous about sailors pursuing the shortsighted activity of killing turtle females on their ponderous progress from the water edge to the upper beach where their eggs, buried in the sand, would be safe from the seawater while the sun incubates them. Such a procedure, followed up at many places, in combination with egg-collecting, is inevitably leading towards a catastrophe for the species. Whether the Umm an-Narians were sufficiently aware of the balance of nature not to indulge in similar stupidity, we do not know for sure. The bone remains do not allow a sexing of the killed turtle specimens. Without firm evidence, however, we may justifiably suppose that people also in those days gathered turtle eggs as a welcome contribution to their diet.

Here may be intercalated a few thoughts on man's attention to other species in his surroundings, and, in particular, on the Umm an-Narians' attitude towards natural creatures. Clark, in his *Animals and Men*, as is typically agreed upon by investigators of such subjects, points to the close spiritual relationship between men and animals in prehistoric times and, further on, though more sporadically perceived, in historic times. « Hunting for their necessary food, and admiring to the point of worship »

(Clark 1977: 14), gives the underlying character of man's conduct towards animals as long as he lives in close ecologic harmony with his environment, and this is also evident from countless ethnographic descriptions. After the termination of this so-called primitive stage of culture, with man's estrangement from nature and his absorption into a civilization, ancient objects of hunting and/or totemism may continue a symbolic existence in institutionalized religion in the form of sacred animals (or they may become over-exploited and exterminated!). Ancient Egyptian culture exemplifies this to extravagance. Clark even goes so far as to say (*ibid.*: 15-16), « The Egyptians loved animals ». This, however, is an overstatement, as well as Clark's remark (*ibid.*: 16) that « such sentiments [love of animals] could not exist in that other early civilization which for convenience we may call Mesopotamian » (see van Buren 1939). The Egyptian may have loved those animals which were held sacred inside his own local district, but sometimes he did not abstain from pursuing animals worshipped in the neighbouring districts (also in a manifestation of religious intolerance, see Hopfner 1913). Whether or not we may talk about love of animals, we can maintain that protection of animals, though not necessarily based on juridical laws, is of ancient date. Genuine hunting people at all times have rarely over-exploited their game. Over-exploitation occurs, for example, where the human population is not *solely* dependent on the resources of its immediate surroundings. This is widely experienced at the present time, but also manifested itself before. The known remains of habitation of Umm an-Nar, together with archaeological data from the area, may suggest that the people who settled there were not members of a 'dugong-turtle hunting culture', but, while they lived from what was within their reach, their main preoccupation was different from hunting/fishing and may have been trade (Frifelt, this volume). If so, we may presume that their level of consciousness towards the surrounding nature was rather low.

Returning to the exploitation of green turtles, they are pursued for their meat. Oil can be pressed from the body (and from their eggs). The skin can be tanned and used for leather. The horn scutes of the shell in all probability were employed by the Umm an-Narians for the fabrication of various utensils

and perhaps ornaments, although it is the somewhat smaller hawksbill, *Eretmochelys imbricata*, which is being commercially exploited for 'tortoise shell' at the present time (see Bustard 1972: 26, for the traditional local use of green turtle products). A word which may signify 'tortoise shell' is mentioned in the Ur texts at the time of the Larsa dynasty (early 2nd millennium BC, Leemans 1960). These texts list several products which came into lower Mesopotamia as a result of overseas trade in the Persian Gulf region, mainly or exclusively via Tilmun (Bahrain or Failaka?). Such textual information about turtle scutes has not been supported by archaeological evidence, though this may be due to environmental conditions like those at Umm an-Nar being hostile to the preservation of such material. 'Tortoise shell' was much in use in ancient Egypt, so it is thought unlikely that it should not also have been so in ancient Mesopotamia (Leemans 1960, in particular fn 4, pp. 25-26). Since there is plentiful evidence for trade between lower Mesopotamia and the Indus region by way of the Persian Gulf in the 3rd millennium BC (Leemans 1960), and several indications that Umm an-Nar was part of this pattern of trade routes (e.g. Frifelt 1975a) with the main emphasis on connections with southeast Iran and Baluchistan (Tosi, this volume), it would not be unthinkable that Umm an-Narian turtle shell found its way to ports along the south coast of the central Asian mainland perhaps as transit stations on its way to the interior. Similar considerations may perhaps be made concerning turtle oil which is nowadays being employed as a basic constituent of various cosmetics and may have had corresponding uses in ancient times.

The interrelations between an animal's structure and its environment, already noted for the dugong skeleton, may also be discussed for the turtle bone structures. The turtles' relatives, the tortoises, living on land (and in fresh water), typically have heavy and huge (relatively speaking) bony shells in which, with head, limbs and tail retracted, the soft parts are well protected. Their dermal armouring is reminiscent of that of some of their extinct distant relations among the archosaurs, the Ankylosauria, and of the glyptodonts among the mammals. However, none of these ponderous and stiff-bodied creatures would have been good swimmers. Thus, assuming

that turtles developed from tortoise-like landforms, for which there are some, though insufficient, indications, an adaptive reduction of the shell bone structure would be a precondition for their success when leaving shallow protected waters and moving into the oceans. Turtles are agile and effective swimmers whose bony shells are less complete than those of typical tortoises. There appears to be an evolutive tendency inside this group towards shell reduction, the more pelagic forms among them being the leathery turtles, *Dermochelys coriacea*, with a reduced bony shell. In young green turtles, both the bony carapace (in the strict sense: the dorsal shell) and the plastron (the ventral shell) are fenestrated. In older individuals, however, the fenestrae tend to become closed by growth of the individual bones. Big turtles, like big dugongs, have few enemies. It appears that only sharks and man kill them.

CULTURAL INTERLUDE

Although dugong and turtle dominated among the faunal remains, they appear not to have been the dominant creatures in the Umm an-Narians' world of art and religion (this is in harmony with the above considerations on cultural stage). The two animal forms were consumed but not venerated, as far as can be concluded from contemporaneous pictures from the island. Not many such pictures have been found, but those recorded until now show quite another assortment of forms: dromedary, ox, oryx antelope, snake, and a figure which has been identified as «reminiscent of an idol» (for the two last-mentioned, see Thorvildsen 1963; for the others, see below). We do not know whether these were pictured for symbolic reasons, or because they satisfied man's aesthetic sense more perfectly than the marine beasts, or for other reasons. We may, however, make a comparison with the European situation where in bacon producing and consuming countries pigs are very rarely pictured, unless for advertising purposes, whereas illustrations of deer, in particular stags, used to be very popular. Wild boar was often pictured in times when it constituted a favoured, and dangerous, hunting object for the upper classes of society, and fine breeds of horses have been continuously reproduced in art for more than two millennia as expressions

of beauty, and of their owner's wealth and ability. In the Christian religion, the sacred animal is man himself, therefore European religious art abounds in pictures of our own species.

THE DROMEDARY (fig. 8.10-15)

The genus *Camelus* is represented by about 200 bone and tooth fragments. (A number of undetermined splinters may also be cameline). None of the fragments show more similarity to parts of the Bactrian camel skeletons than to parts of the dromedary skeletons available for comparison. (Few, or perhaps no, morphological skeletal features can be pointed out as reliably distinguishing all dromedaries from all Bactrian camels. Generally, however, Bactrian camels are the heavier forms, with relatively stouter and shorter limb bones than those of dromedaries. Clutton-Brock 1970). Since no trace of Bactrian camel has ever been encountered in the southern part of Arabia, all the camelid remains under consideration are referred to *Camelus dromedarius*. Whether wild or domestic dromedaries (or both) are represented cannot be said on the basis of the fragments, since even complete dromedary skeletons show no definite domesticative characters. Two reliefs on ashlar of one of the contemporary grave mounds on Umm an-Nar show single dromedaries, without any indication of close acquaintance with man such as halters or accompanying herdsmen (Frielt 1975a: figs. 37 and 38).

Relevant sources suggest that the dromedary was first effectively domesticated in Arabia (e.g. Zeuner 1963). Ripinski (1975) states, as far as can be interpreted from the text, for the dromedary: « the domestication of the camel in the Old World must have occurred no later than the fourth millennium BC ». He tentatively refers to (supposedly domesticated, one-humped) camels coming from South Arabia into the Nile Valley, but without giving any indisputable instance in support of it.

As with many cultural innovations, domestication of the dromedary may not have occurred only at one single place and at one particular time, but during a certain epoch the circumstances may somehow have proved ripe for the process to be undertaken. In all probability, approaches were made here and

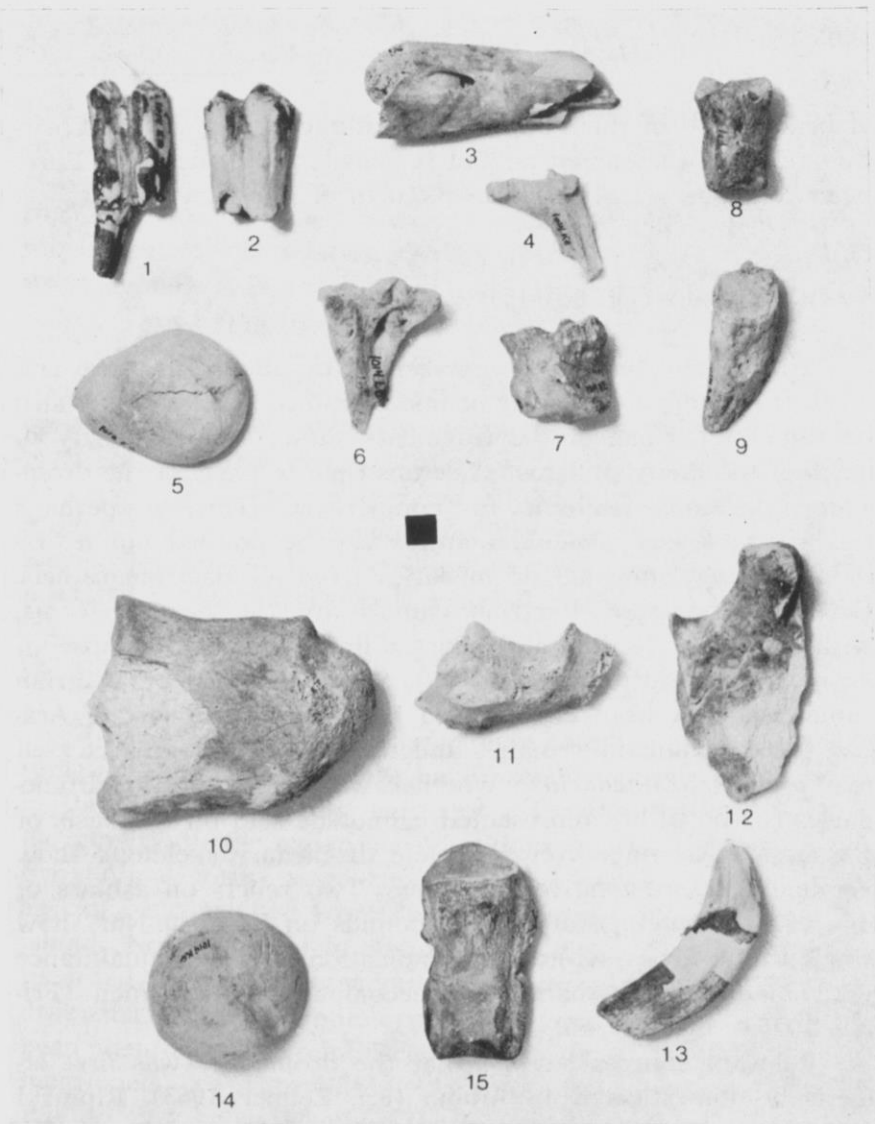


Fig. 8. — *Bos domesticus* (?zebu) 1. Lower molar. 2. Upper molar (m^l sinistra). 3. Anterior part of left mandible. 4. Proximal part of rib. 5. Disjointed proximal epiphysis of femur. 6. Fragment of proximal end of left metatarsus. Median posterior articular facet short and broad compared to the corresponding facet in *Bubalus bubalus*. 7. Distal epiphysis of metapodial. Medial side (marked by 1014 KE) flat, which indicates *Bos* rather than *Bubalus* judging from available comparative material. 8. Phalanx no. 2. 9. Phalanx no. 3 (distal phalanx). *Camelus dromedarius* 10. Proximal part of left ulna of large adult individual. 11. Part of right co-ossified ulna-radius showing proximal joint surface (elbow joint). Very young individual. (Co-ossification prenatal). 12. Incomplete posterior part of left mandible with articular condyle (jaw joint) and angular process (protrusion on the left side of figure). 13. Left lower canine, slightly worn. 14. Disjointed proximal epiphysis of femur. 15. Phalanx no. 2. (Black square indicates 1 cm²).

there where man and animal met in a common environment and young individuals were sometimes captured. And when the behaviour of humans and tamed animals co-adapted into a kind of symbiosis, this was the initiation of domestication.

Dromedaries or one-humped camels are known at present only as domestic animals, while Bactrian or two-humped camels are said to exist as wild- (as opposed to stray-) forms in the foothills of the Altai Mountains adjacent to the Gobi Desert (Zeuner 1963, with photo). Some researchers who advocate that the dromedary is merely a domesticated form of the two-humped camel especially adapted for hot desert environments, or that the two are simply variants of one wild form, regard them as constituting a single species, while others separate them taxonomically into *Camelus dromedarius* and *Camelus bactrianus*. The genetic barrier between the two (?) species, however, does not appear to be a perfect one (Zeuner 1963). The origin of the dromedary, whether it is natural or artificial (i.e. due to domestication), has so far not been solved on the basis of fossil evidence. In contrast to Ripinski (1974), Grattard et al. (1976), after a thorough investigation of African fossil camelid remains, maintain that « the classification and the affinities of the African fossil Camelidae still pose a number of problems ». This statement can be taken to include also what we know from the Arabian Peninsula and the Near East region (Howell et al. 1969) which until now have yielded very few fossil camelid remains. Concerning younger, subfossil camelid remains in the Near East region, Clutton-Brock (1970) assumes on the basis of bones from various sites that « the camel present during Upper Pleistocene times was the dromedary or a species very similar to it ». Ancient man-made rock carvings from the Saharan and Arabian deserts (Ripinski 1974, 1975) may be taken to indicate the presence of wild dromedaries there before any probable domesticative intervention by man. (Unfortunately, exact dating of petroglyphs cannot be made). That wild dromedaries may have populated vast hot and arid regions of the Old World, more or less as do (or did) certain antelope species, e.g. the Arabian oryx, seems to be supported by historical sources. Zeuner (1963:340) refers to Strabo and Diodorus Siculus who mentioned wild dromedaries as occurring in Arabia about the commencement of the Christian era. Thereafter, the wild

form may have become extinct (or exterminated), or, as suggested by Zeuner (*ibid.*: 365), the little that possibly remained of the wild dromedary in North Africa may have become absorbed in the advancing domesticated form.

Concerning the origin of camels, the genus *Camelus*, it may be summarized that the camel family, the Camelidae, originated during Tertiary times in the New World (see Romer 1966). From North America, camelids spread via the Bering Landbridge to Asia towards the end of the Tertiary some 4-5 million years ago; others spread to South America and there developed into the various llama forms. Like horses, camels died out in North America during the Quaternary, but proliferated in the Old World, so that finds of fossil camelid remains are rather common in Asian and southeast European Pliocene-Pleistocene deposits together with remains of mastodons, hipparions (three-toed horses), ostriches, horses, etc. (Howell et al. 1969). The oldest camelid find in Africa is from Ichkeul, Tunisia (Arambourg 1970: 14); its age is about 4 or perhaps 4.5 million years (Jaeger 1971). A worn left lower molar from the Shungura river and lake deposits of the Omo Valley in southwest Ethiopia, is about 3 million years old (Grattard et al. 1976). This last-mentioned and younger finds establish the presence of the genus *Camelus* in North and East Africa and in the Near Orient (Jordan Valley, Haas 1966; Syria, Hooijer 1961; and others) contemporaneously with the genus *Homo*; and, in particular, together with palaeolithic, neolithic and historical man, *Homo sapiens*.

But the question is still open: when did man start to attach any other interest to camels than that of a hunter's, i.e. when were camels first domesticated?

Approaching the problem on the Arabian Peninsula (there is another problem-sphere around the domestication of the Bactrian camel in Asia) from progressively older historical records, written sources reveal that Egypt was invaded by the Assyrians under Esarhaddon in 670 BC who obtained dromedaries from the Arabs to carry water reserves for his troops. Assyrians were in frequent quarrels with northern Arabs who, according to Zeuner (1963: 345), « evidently made full use of their ability to withdraw on their dromedaries into the desert where the horse-riding Assyrians could not follow », until Ashur-

banipal, by equipping his officers with dromedaries, met the Arabs on equal terms and destroyed their northern sheikdoms (fig. 9). Semitic people coming from the south and settling in the Euphrates-Tigris valley in the 3rd and 2nd millennium BC are believed to have known the domesticated dromedary; among other things a copper amulet from Akkad around 2400 BC is taken to show it (Zeuner 1963), and a still earlier clay figurine

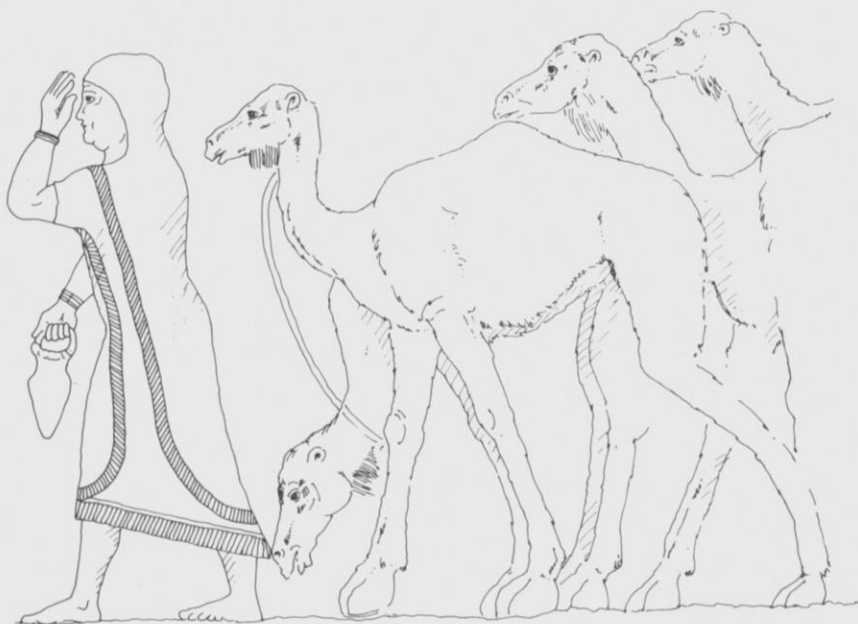


Fig. 9. — Arabian bedouin wife with dromedaries, asking the Assyrian king Tiglath-pileser to show mercy. Drawn by Bente Surlyk Clemmensen from Assyrian stone relief (Nimrud, Central Palace) in the British Museum (photo published in Barnett 1960: 39).

found at Uruk has been identified as a dromedary (van Buren 1939). As referred to above, there are traces of possibly domesticated dromedaries in ancient (predynastic and early dynastic) Egypt and in ancient Arabia (Ripinski 1974, 1975).

However, the farming population of the lands around the big rivers, the Euphrates-Tigris and the Nile, appears not to have assimilated the dromedary as a utility animal during the early millennia as was done with, for example, the ox and the

water buffalo. This may be ascribed to, among other things, the fact that dromedaries need space, and that they do not thrive in humid surroundings. Zeuner (1963) also gives other good reasons such as the dromedary's bad temperedness, its 'stupidity', and its bad smell which is not easily tolerated by other domestic animals, in particular horses. The apparent (and probably real), comparatively vague interest among the early civil populations of the big river cultures in writing about, sculpturing or drawing dromedaries (Ripinski 1974) may find a natural explanation in the fact that their awareness of them was generally negligible. Even as objects for hunting, dromedaries may not have attracted these people, since no hunter could possibly follow the animals in their natural environment unless mounted on a dromedary. All in all we have the impression that early literate people were not very much concerned with dromedaries, and that early people concerned with dromedaries did not write about them. So Ripinski may be right, even if we shall never be able to prove it, in his mentioned statement of an early domestication of the dromedary.

In the presently considered Umm an-Nar find, the dromedary bone fragments derive from various-sized adult, juvenile and (?) newborn individuals (the very young ones being few). All parts of the animal are represented, the distal limb segments (i.e. below the elbow and knee joints) in a great number.

Seven of the dromedary bone specimens were identified by the archaeologists as being artifacts. One, designated a needle, is derived from a dromedary metapodial, one is the proximal epiphysis of the upper armbone (humerus), and the remaining five are thighbone heads (capita femorum). Four of these have been separated from the larger part of the femur by a cut, whereas one is a disjointed epiphysis. The limb bone heads, artificially pierced through the middle, are interpreted as spindle whorls.

In mammals an important part of bone growth takes place in the cartilaginous zones between the middle and larger part of the bone, the so-called diaphysis in the long bones, and the epiphyses which are the extreme bony end parts of the bones. In adult mammals the epiphyses are firmly co-ossified with their diaphysis. In juvenile mammals the tissue of the cartilaginous zones disintegrates like other soft tissues of the body

upon death of the animal. 'Free epiphyses' thus indicate an immature or juvenile state of the animal in question. In dromedaries free proximal thighbone epiphyses supposedly signify an animal younger than the age of 5-6 years (perhaps more. Lists of ages for co-ossification of diaphyses/epiphyses have been worked out for horse, ox, pig and certain other domestic animals. A similar list for dromedaries was not available to the author and may not yet have been made). Among the dromedary bone remains there are other free epiphyses than the above mentioned, and also parts of diaphyses without epiphyses. These, as well as a little-worn, well preserved, big lower canine, indicate younger animals. (Clutton-Brock 1962, gives an age of 7-8 years for the eruption of the permanent lower canine in dromedaries).

It has been suggested that dromedaries were used for carrying copper from the eastern mountain ranges through the western desert of the Oman Peninsula for disembarkation from Umm an-Nar (Frifelt 1975a). There may have been a small herded flock of dromedaries on the island, but there certainly was insufficient space for wild ones to live there together with man. Flocks belonging to Umm an-Narian citizens may have been herded on the mainland, or bedouins there may occasionally have handed over some of their dromedaries to be slaughtered on Umm an-Nar, perhaps in exchange for various goods. The meat of dromedaries may have been a required component in ceremonies connected with the entombments? Only if the dromedaries were brought to the place as living members of a cultural pattern, economic, religious or of some other kind, would they be found represented in the refuse heaps of the town by such useless and weighty parts as their distal limb bones. Therefore, it seems permissible to suppose that the dromedaries came to the town of Umm an-Nar under the care of man as domestic animals, and not in the form of joints cut out of game hunted in distant deserts.

THE OX (fig. 8.1-9)

Judging from the amount of specimens present among the collected animal remains, oxen were not eaten in a great num-

ber by the Umm an-Narians. Less than 30 fragments have been referred to this group; they derive from various parts of the animal's body. Small juvenile individuals appear not to be represented (or have left no determinable parts).

Some of the fragments exhibit features which refer them to the genus *Bos* as distinct from *Bubalus*, the water buffalo, both of which occurred as domestic forms in the 3rd millennium BC in Sumer, and for *Bos* certainly, for *Bubalus* probably, in the Indus Valley also (Bökönyi 1974; Zeuner 1963). In spite of the fact that some skeletal elements in *Bos* and *Bubalus* do not permit a distinction between the two forms on purely morphologic grounds so that some of the fragments cannot be referred to one or the other of the two, it is believed that most probably all ox (in a large sense) remains of the collection derive from *Bos*. The assumption is inspired by the common knowledge about the Indian buffalo's indispensable demand for fresh water not only for drinking but also for submerging its whole body at least once a day. And nothing until now has revealed that such facilities were within reach of the place where the skeletal remains were found. It is also supported by Bökönyi's statement (1974:151) that « the water buffalo reached the Arabs in the 1st century A.D. and since the 2nd century A.D. it is often mentioned in Arabic poetry ».

A relief carved on a block from the Umm an-Narian grave mound 'cairn II' where also the blocks with dromedaries were found (Thorvildsen 1963), shows an ox with its horns directed upwards from the skull (Glob 1960: fig. 4). Paintings on two pottery vessels found in Umm an-Narian graves present humped oxen with upward pointing horns; these are zebu (Frifelt 1975a:362 and fig. 41). Whether the ashlar relief is also meant to show a zebu although deprived of its characteristic hump (? a humpless zebu like those indicated by Zeuner 1963:236, resulting from interbreeding with *primigenius* cattle) or pictures a member of a more typical *primigenius* breed, cannot be settled. But, without doubt, reliefs as well as paintings illustrate oxen of the *Bos* genus. Wild *Bos* species were not, as far as is known, present in post-Pleistocene southern Arabia. Among domestic oxen (both domestic humpless and humped cattle in the Near East are believed to derive from the aurochs, *Bos primigenius*, or perhaps, for the zebu, from *Bos*

namadicus, Zeuner 1963:239), judging from climatic conditions suggested by the presence of the dromedary, zebu rather than humpless domestic ox should be expected to be found on Umm an-Nar. Dales (this vol.) makes an interesting assumption about a cult involving the humped bull in Balakot, south Pakistan (first half of the 3rd millennium BC or earlier). The Balakotians appear to have been involved in long distance trading activities which, although they show an inland orientation (Meadows, this vol.), may not have been quite without influence upon life on Umm an-Nar, especially as some of the major Umm an-Narian cultural connections were with southwest Iran-Baluchistan and Pakistan as earlier mentioned. Could the pottery with zebus have been imported to Umm an-Nar from one of these places? Or could zebus?

All ox remains considered here have been compared with skeletons of zebu with which they conform very well in morphology. The zebu race, like other domestic animal forms, exhibits large variation in the size of individuals. It appears from the comparisons that the oxen found on Umm an-Nar were middle-sized animals, neither very big forms, nor small stunted individuals. This might be taken to indicate, supposing that climatic conditions and vegetation were not very different from the present day, that the oxen were not bred on Umm an-Nar where conditions are now unsuitable for ox breeding. It may be that zebus, which endure hot and dry surroundings better than other domestic oxen, were driven through the desert from, for example, the Buraimi oasis to the coast opposite Umm an-Nar and then transferred to the island. There are several indications of cultural connections between sites in Oman and Umm an-Nar, and the distance between Buraimi and Umm an-Nar is only about 150 km, or 2-3 days with a loaded camel caravan (Frifelt 1975a: 366). Another explanation for the presence of zebus on Umm an-Nar might be, as hinted above, that the oxen were brought to the place from the Asian mainland onboard the merchant ships. Or was the climate different? (see below).

What were the oxen used for on Umm an-Nar? For their milk, meat, dung (as fuel, fertilizer), blood, as beasts of burden, draught animals or for ceremonial purposes? Milking of cows was known in the early 3rd millennium BC in Mesopotamia,

as appears from a mosaic frieze in Ur (Zeuner 1963: fig. 8.18). That oxen were sometimes slaughtered and eaten on Umm an-Nar seems demonstrated by the remains. Concerning the ontogenetic age of the killed oxen it can be said that six back teeth (premolars and molars), found among the *Bos* material, derive from late juvenile and young adult individuals as can be inferred from their state of wear. One (perhaps two) rib fragment(s) indicates a late juvenile stage, as is also shown by a free caput femoris (the age of the corresponding animal upon death was around 3 years, Cornwall 1956:229) and by two heelbone (calcaneus) specimens without epiphyses. One of the calcanei is noticeably large, and may indicate a young bull. A fragment of the proximal end with the joint surface of a metatarsal bone shows co-ossified epiphysis-diaphysis (fig. 8.6; morphologically *Bos* and non-*Bubalus*). However, since in ox metapodials the proximal epiphysis co-ossifies with its diaphysis before birth of the animal, this specimen may after all be ontogenetically young. A free distal metapodial epiphysis (fig. 8.7; more like *Bos* than *Bubalus*) indicates an animal of about 2 years age. It appears that the killed oxen were large juvenile and young adult animals. If they were females it may be concluded, from the considerations on age, at least for these particular individuals, that milking was not man's major interest in them. None of the fragments, however, permit a reliable sexing.

THE OTHER BOVIDAE: ORYX, GAZELLE, GOAT AND SHEEP (fig. 10)

In the Arabian region at present, between 140 and 150 species of wild land mammals are known to exist (Harrison 1964). Not fewer, supposedly, were found there 4-5 millennia ago. Only two of these species (leaving dromedary out of consideration) have been traced with certainty among the skeletal remains from Umm an-Nar, viz. *Oryx leucoryx* and *Gazella subgutturosa*.

125 fragments of the collection have been referred to the oryx antelope. Among these, two are cranial parts: a fragment of a left upper jaw (fig. 10.7) with tooth alveoles and part of the palate preserved, and the posterior part of a left lower

jaw (dentale) with condyle and coronoid process. All other pieces are from various parts of the body: vertebrae (some of them almost complete) including atlas and epistropheus, rib frag-

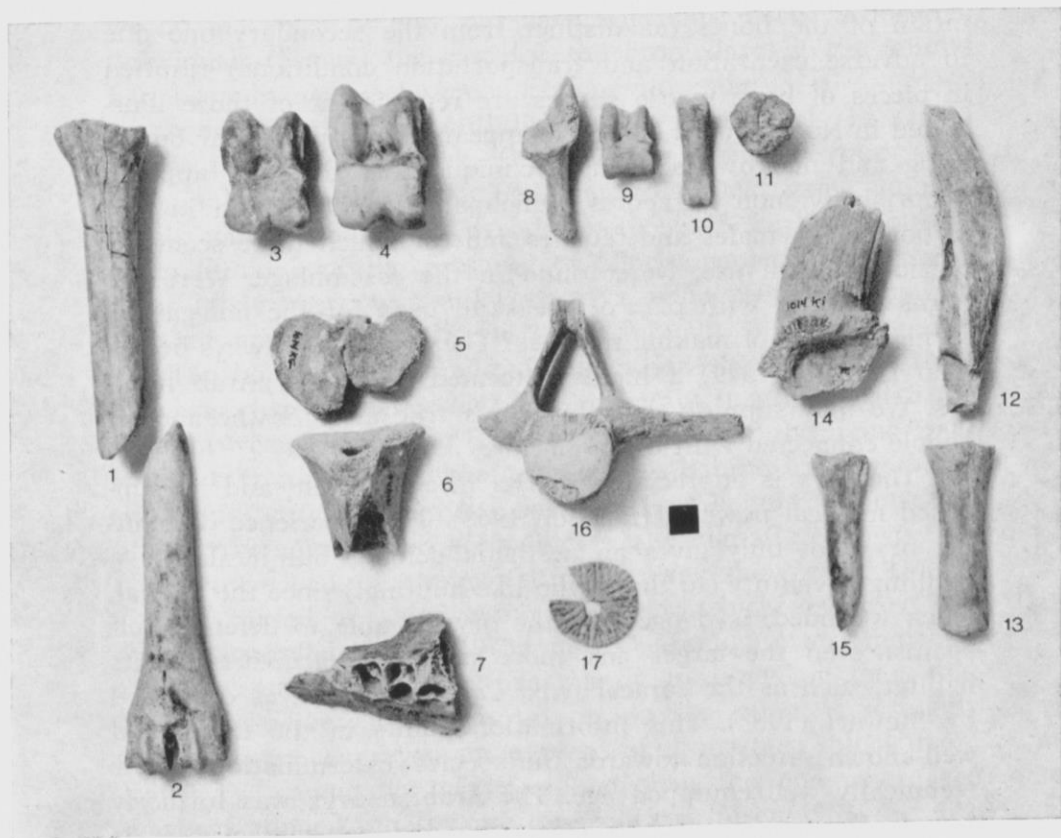


Fig. 10. — *Oryx leucoryx* 1. Proximal part of right metatarsus. 2. Distal part of right metacarpus. 3. Right astragalus. 4. Right astragalus of *Oryx beisa* (the African oryx, to compare size with 3). 5-6. Proximal part of left tibia of big juvenile individual (5: free proximal epiphysis; 6: proximal part of diaphysis). 7. Part of left maxillary with alveoles for premolars and first molar. *Capra* sp. 8. Right calcaneus. 9. Right astragalus. 10. Phalanx no. 1. 12. Twisted horn core (domestic goat). 13. Proximal part of left metacarpus. *Ovis* sp. 11. Proximal part of right metatarsus, seen from the end. *Gazella* sp. 14. Right horn core (*Gazella subgutturosa*). 15. Proximal part of left metacarpus. Family Didelphinidae. 16. Trunk vertebra with relocated unfused epiphysis. 17. Separate vertebral epiphysis showing rugous growth zone surface. (Black square indicates 1 cm²).

ments, parts of scapula and sacrum, long limb bones in a more or less broken condition, and complete carpal/tarsal and digital bones. The majority of the bones derive from adult individuals; no small juvenile forms are represented. The original fragmentation of the bones (as distinct from the secondary one due to adverse excavation and transportation conditions) resulted in pieces of bone whose shapes are reminiscent of those illustrated in Noe-Nygaard (1977). It appears that a particular butchering and marrow-fracturing technique was generally applied. Surprisingly, non horncores, which are roughly 0.5 m in size in both adult males and females and for which there seems to be no practical use, were found in the assemblage. Were the horns together with part of the skull used for the non-gastro-nomic purpose of making trophies? The oryx « has always been » (Harrison 1968:349) a highly esteemed object for Arab hunters. We may suppose that this holds true also for the ancient people connected with Umm an-Nar.

The oryx is appreciated for its meat, its pelt, and its supposed medical powers (Harrison 1968). The experience of hunting oryx not only gives an aesthetic delight, but it also is a thrilling adventure (to those who like hunting!) since the animal, when wounded, is dangerous; the oryx is able to defend itself against even the larger and more powerful carnivores in its habitat, such as the caracal lynx, *Caracal caracal*, as described by Stewart (1963). This information points in the tragic and well-known direction towards the species' extermination in our technically well equipped age. The Arabian oryx was formerly found all over the Arabian Peninsula and nowhere else. It is perfectly adapted to the desert habitat. It needs no free water for months, but 'drinks' dew and juices of various succulent plants. It is said that in spite of its unapproachable and wild nature it is easily tamed (Harrison 1968). The same is true for the other big desert antelope, the eland, *Taurotragus oryx*, the largest of African antelopes, which lives in various habitats in East Africa, including the edge of the Sahara (Taylor 1969). In recent times the eland is being tentatively reared as a domestic animal in southern USSR (Treus and Kravchenko 1968), and it is most likely that this antelope as well as many other members of the family Bovidae, including of course the traditional domestic forms ox, goat and sheep, have been periodi-

cally tamed through man's history. Did the Umm an-Narians keep the oryx as a tame animal? In all probability not, considering the above conjectures of their environment and way of life. Among such a comparatively large number of bone fragments we might expect to find, but have not, some parts of juvenile individuals (as was the case for the dromedary) if the animal had been living in close connection with man.

A number of oryx still live in the deserts of the Oman Peninsula. (Harrison 1964: 13, hopefully refers to good steps being taken by the Sultan of Oman to protect game animals in his country; but four years later, 1968: 348, he loses courage when thinking of the presence of oil companies in the area). Most likely there was a larger oryx population in Oman in the 3rd millennium BC.

The bone remains under investigation show an oryx form which is clearly smaller and less exuberant in growth than the living African *Oryx beisa*. The same is true for the living *Oryx leucoryx*. It appears that the Arabian oryx habitat has not changed significantly during the latter 4-5 millennia, though its limits may have moved according to any climatic changes.

Two ancient pictures on Umm an-Nar show oryx. One is a relief carved on a grave mound ashlar which also carries a dromedary relief (Frifelt 1975a: fig. 37; the figure text indicates a gazelle, but the relatively heavy body and long tail show that the 'gazelle-like' animal is an oryx). The other is a highly stylized figure engraved on a piece of a masonry block from 'cairn IV', a smaller grave mound than the one where the above mentioned reliefs were found (Thorvildsen 1963: fig. 14).

The *Gazella* genus is represented by only a few fragments. These include the proximal part of a left metacarpal bone, and parts of 5 horncores: the basal section of three horncores with the medial part of the frontal bone well preserved, and a number of smaller horncore fragments, all from one excavation subarea which, judging from their morphologic characters, are most likely parts of two specimens. An unerupted premolar is also gazelline as are some limb bone sections: a fragment of the proximal part of a metatarsus, and the diaphysial part of a right radius. Some more dubious pieces may also be from gazelle.

At present, three species of gazelle occur on the Arabian

peninsula. Of these, two — *Gazella gazella* and *Gazella subgutturosa* — have been encountered within recent time in Oman (Harrison 1968). According to Thesiger (1949), referred to by Harrison (1968), *Gazella subgutturosa* was still (in 1949) surviving on islands to the west of Abu Dhabi. Skeletons of the three mentioned species can be separated on cranial characters: in males of *Gazella subgutturosa* the horns are long and very close together at their bases (the females generally are hornless), and each horn is quite strongly compressed laterally; in the other species the horns are wider spaced at their bases (Harrison 1968). Comparisons with skulls of various species, and in particular with the three mentioned ones, show that all three well preserved basal horncore parts conform to those in males of *Gazella subgutturosa*. Concerning the other gazelle fragments, a detailed determination has proved impossible on the basis of the material available for comparison.

Gazella subgutturosa is widely distributed on the Asian mainland. It appears that it was also widely distributed in late prehistoric times, when the species contributed to the human diet, for example in Balakot (Meadow, this vol.). At present, it is thought to have greatly diminished in numbers in the northern part of the Arabian region due to over-exploitation. In Arabia it may only be abundant in the sand deserts in the southern and eastern parts of the Peninsula (Harrison 1968).

The remaining bone fragments from smaller artiodactyles pertain to goat, *Capra*, and sheep, *Ovis*. Osteologists always have trouble when it comes to the point of separating these two forms on the basis of bone fragments. Domestication has resulted in a multitude of races which, taken together with the wild forms, constitute a very confusing picture as to animal size and development of horns. Morphologically, most skeletal elements of goat and sheep are disturbingly similar. Yet, with a large comparative material available, distinction is in many cases feasible.

Among the total number of around 80 goat/sheep fragments, some 15 pieces are believed to be more similar to goat than to sheep, whereas only 2 are more sheep-like than goat-like. This suggests an overweight in the number of goats among the ovicaprines on prehistoric Umm an-Nar, but it also indicates that sheep were present (see below).

The fragments are from various parts of the skeleton, including teeth. Both juvenile and adult individuals are represented; a single fragment, the distal part of a metacarpal, is from a very young animal. A fragment of particular interest is part of a screwed horncore of goat. All wild Arabian goats have straight horns, and spiral horns indicate a domestic goat (A. W. Gentry, pers. comm., 1976). The presence of domestic goat (and sheep) on Umm an-Nar is not surprising since both goat and sheep are known as domestic forms very early in the Near Orient, supposedly before 7000 BC (Bökönyi 1976).

THE WHALES (fig. 10.16-17)

Members of this other group of large sea mammals appear also to have been eaten by the Umm an-Narians, though much more infrequently than the dugong. The bone material shows two forms. One is relatively small, and is represented by a vertebral body, a trunk vertebra which may have been complete when found, both without epiphyses, and two incomplete free epiphyses which were secured from the same excavation field as the sub-complete vertebra (fig. 10.16-17); one epiphysis was originally connected with this vertebra (which is seen from the pattern of ridges on their opposing surfaces), the other may have been so. Vertebral epiphyses in whales co-ossify with their corresponding diaphyses (the vertebral bodies) very late in ontogenetic development, so the whale(s) in case may not have been typically juvenile when killed. Size and morphology of the bones refer this smaller whale form to the family Delphinidae, and point to a species somewhat larger than the common dolphin, *Delphinus delphis*. But whether the bones represent a member of *Delphinus* or of *Sousa*, which both occur in the Persian Gulf, cannot be said.

To the other whale form are referred around 40 larger fragments some of which evidently are parts of the same elements. Free epiphyses, vertebral bodies, part of a jaw, and perhaps other bones are represented. The particular structure of the bone material makes the bones both fragile and very easy to recognize. On the basis of form and size of the epiphyses, the bone material is tentatively referred to the genus *Ba-*

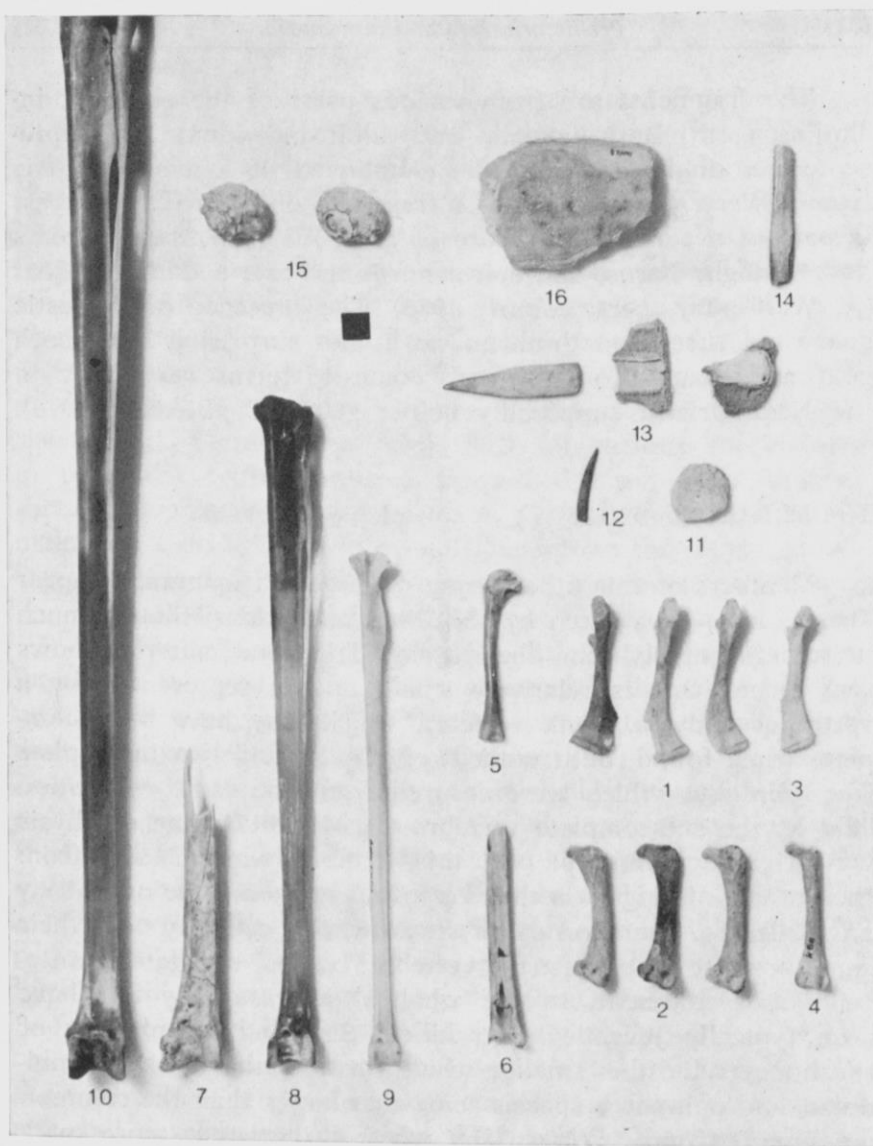


Fig. 11. — Aves 1. Three coracoids of cormorant. 2. Three femurs of cormorant. 3. Right coracoid of snake bird. 4. Right femur of snake bird. 5. Left humerus of duck. 6. Distal end of tibiotarsus of flamingo. 7. Distal end of left tibiotarsus of *Ardea bennuides* n. sp. 8. Left tibiotarsus of *Ardea goliath*. 9. Left tibiotarsus of *Ardea cinerea*. 10. Left tibiotarsus of *Ephippiorhynchus senegalensis*. Elasmobranchii 11. Calcified vertebral centrum of elasmobranch. 12. Dorsal fin spine of shark. 13. Lateral rostral 'tooth' (enlarged dermal denticle); calcified cartilage of rostrum with alveole; part of rostrum with weathered 'tooth' in alveole; all of sawfish. 14. Incomplete tail spine of stingray. Mollusca 15. Two turban shells, *Turbo* sp. 16. Dorsal shell of cuttlefish, *Sepia* sp. (Black square indicates 1 cm²).

laenoptera which occurs in the region. A closer determination has not been possible. (Approx. diameter of epiphysis: 23 cm).

THE BIRDS (fig. 11.1-10)

While the mammal remains are certainly the more conspicuous of the collection, bird bones are numerous. As a rule, bones of birds are hollow and thin-walled; some of them, in living birds, have interior air-sacs (among the limb bones, the humeri often have) whereas marrow fills up the interior cavity of others. Their fragility, together with morphology, make bird bones easy to distinguish from the bones of most other animal forms.

It appears that many of the bird bones of the collection are rather strongly fragmented. This may be caused by pressure from heavier mammal bones in the midden or during transportation and hardly reflects any marrow-fracturing technique.

1300 bird bone pieces have been morphologically and taxonomically determined, and several hundred fragments are referred to the group 'undetermined bird bones'. A fragment of a small synsacrum which cannot be referred to any specific bird group may not be part of the original prehistoric material, but is perhaps of later origin. Another collection of subfossil/subrecent bones of small birds and mammals was found in the Umm an-Nar graves. They gradually accumulated there during time as a result of animals living and dying in the ruins. Bones of bats and swifts, which shelter in caves, are common; bones of other forms may have been taken there by avian predators (owls and others) which regurgitate undigested remains of their food such as bones, teeth, feathers etc. A similar derivation may be imagined for the above mentioned synsacrum fragment. The bones from the grave mounds shall not be further treated in the present context.

Among the material from the Umm an-Nar settlement, five species of birds are represented. Cormorants, *Phalacrocorax*, are in the absolute majority both in number of fragments and in number of individuals. This genus of birds is of world-wide distribution, and includes several species which can only with difficulty be distinguished from one another on skeletal mate-

rial. In the present case specific determination has been made on the basis of biogeographic considerations in combination with comparative measurements of bones, in particular of tarsometatarsi, the proportions of which are specifically significant for the cormorants in question, and of which four are preserved in the Umm an-Nar material in a state sufficiently complete for measurements to be taken. All four tarsometatarsi pertain to the Socotra cormorant, *Phalacrocorax nigrogularis*. Variation inside each group of skeletal elements appears sufficiently low to permit the statement that only one cormorant species is represented.

Cormorants live in colonies close to water, either in trees or on the ground. Their food consists of fish, crustaceans and other aquatic animals. While many cormorants may also frequent rivers and lakes, the Socotra cormorant is purely maritime (Hüe and Etchécopar 1970). It nests on the ground, «or on the gravel beaches of flat islands», and is said to be very wild (*ibid.*). All skeletal parts of the bird are represented among the bone remains, the proximal limb bones in greater numbers than the other bones. Only about 2% of the bone material is from juvenile birds. These were fairly big when killed, so their presence among the material does not suggest that they were taken on the breeding grounds (but eggs may have been taken).

Next in numbers to cormorants come snake birds (darters), *Anhinga rufa*, with 32 determined fragments. Snake birds are closely related to cormorants and are rather similar to them in appearance and habits; they are, however, less sociable than their relatives, although they may nest together with tree-nesting cormorants and herons in small numbers. In the Umm an-Nar region they may have nested in the mangrove trees. Or they may, occasionally or daily, have been visiting the place for the purpose of exploiting its fish fauna. Judging from the bird bone collection, where all represented species are well-known consumers of aquatic organisms, life in the lagoon waters must have been abundant. It is generally stated that snake birds are associated with lakes and rivers in the tropical and subtropical zones. According to Landsborough Thomson (1964:177), inland waters in this connection include tidal water, so we may conclude that snake birds may occur in protected marine waters such as the Abu Dhabi lagoons, rather than postulate that pre-

historic snake bird remains on Umm an-Nar indicate fresh water surfaces in the neighbourhood of the island. The same is true for the other represented species, for some of whom salty water may even be essential.

One almost complete humerus indicates a duck of the size of a garganey, *Anas querquedula*; no specific determination is possible. A fragmented distal part of a left tibiotarsus shows the presence of flamingo, *Phoenicopterus* aff. *ruber*, in the area.

Some bird bone fragments, all from a single excavation section, attracted particular interest because of their relatively large wall thickness. After reconstruction, they are seen to constitute the distal part of a tibiotarsus of considerable size (fig. 11.7). Comparisons with tibiotarsi of recent birds show that this prehistoric bird undoubtedly was a heron of the genus *Ardea*, but also that it was much larger than any extant heron. Investigations in the literature, and questioning among palaeornithologists made it evident that no such large heron has yet been recorded.

The question arises: does this lower end part of a single limb bone indicate a new species of extinct birds, or should it be regarded as a trace of a giant individual from within a population of Goliath herons, *Ardea goliath*, which are the largest extant herons? Goliath herons (according to Hübner and Etchécopar 1970) now live in the swampy regions around the lower Tigris-Euphrates, in south Arabia, at places along the coasts of the Red Sea, in East Africa and Madagascar, and they have been recorded from Palestine, Syria, Baluchistan, India and Sri Lanka. They always occur close to water. They may even be seen far out over the sea. How large is the intraspecific size variation of this supposedly non-stationary bird form which populates such an extended area? The question is of zoological relevance and will be further treated elsewhere. Suffice it here to say that: a) the size of the prehistoric heron bone is outside the range of expected intraspecific size variation for Goliath herons; b) some other fragments supposedly belonging to the same giant heron — though whether from the same individual or from another individual of same species cannot be stated — were secured from two other excavation fields in the Umm an-Nar settlement (part of an ulna from one and two parts of limb bone reconstructed from pieces from another);

and c) the distal part of a left tarsometatarsus of a giant heron was found on the Isle of Failaka offshore from Kuwait and is dated from about 1800 BC. Therefore, it can be concluded that a heron form considerably larger than the Goliath heron lived in the Persian Gulf region in the late prehistoric and early historic millennia. A new species will be erected for it under the name of *Ardea bennuides* (Hoch, in prep.).

The species name, *Ardea bennuides*, calls for an explanation. In ancient Egypt, during the 5th dynasty (c. 2466-2322 BC), the town Heliopolis became the place of worship of the sungod Ra (Re). A sacred animal here was the Bennu bird, *benu* (*bnw*). Hieroglyphic texts, which for many centuries of ancient Egyptian history accompanied the dead in their graves, often show the Bennu bird. It may be painted on the inside of the wooden coffins (one such is part of the collection of the Vatican Museum), or it may be included in the picture series of the Books of the Dead. Such books are long (up to 10 m) rolls of papyrus of which one was put beside the deceased man or woman in the coffin together with various amulets. The Book of the Dead summarizes the life history of the dead person and gives good advice concerning behaviour upon entrance into, and life in, the Other World. The text is secret and deals with matters of the gods. The whole procedure, which the deceased has to go through, of being accepted (or refused!) by the gods may be illustrated in the Book. After acceptance (which state is meant to be promoted by the placing of a personal Book of the Dead close to the corpse), the deceased encounters the Bennu bird which may be seen in the picture standing erect in front of the adoring dead person (fig. 12) or perching at one end of the boat that carries the dead along the river Duat through the underworld. This bird is a gigantic heron.

Now it is important to recall that the style in which the ancient Egyptians depicted their surrounding world — plants, animals, events — was formalized naturalistic. The size-proportions are often unreliably reproduced following superimposed rules. The colours are crude corresponding to the level of chemo-technical refinement. But the form is basically copied after nature with a great sense of detail.

The Bennu bird is a holy bird and this state may have been transferred to the picture by way of size. It is endowed with

the duty of carrying the soul of the deceased to Ra, the supreme god. That the pictured Bennu bird is morphologically a heron is beyond question (although in some Egyptological literature it may be encountered in the shape of a wagtail; but this seems to apply only to texts relating to the time of the Old Kingdom, van den Broek 1971). The Bennu bird could be an enlarged grey heron, *Ardea cinerea*, which is known from Egypt.



Fig. 12 — The Bennu bird being worshipped by the deceased architect Ankerkhau. (Thebes, 20th dynasty). (Note the Bennu bird-hieroglyph in the text above the hands of Ankerkhau. The nuchal feathers also characterizing the hieroglyph cannot be seen on the rather poor photographic reproduction).

Alternatively, could it not be that the Egyptians knew about a large, beautiful heron which they had seen on trading expeditions in the Arabian seas (there was Egyptian trade in the Red Sea region; and the route around southern Arabia was not too long for the sea-farers of those days), or which they

had at least heard about from people of the lands around the Persian Gulf? Egyptians met traders from the Mesopotamian lands at the Mediterranean coast in northern Syria where a great exchange of goods took place (e.g. Leemans 1960:4). Perhaps the bird sometimes visited the swamps of the Nile as the Goliath heron visits lakes in Palestine. (There are no reasons to suppose that such bird would be flightless due to size. The saddlebilled stork *Ephippiorhynchus senegalensis*, whose tibiotarsus compares in size to that of the large heron, fig. 11.10, can fly). Herons have always attracted man's attention, rarely as objects of food, mainly as objects of beauty. Grey herons may still be seen, in cages or in the free, in public parks in Europe, being kept there for the pleasure of promenading citizens. Incidentally, according to Landsborough Thomson (1964:366), herons do well in captivity and make good exhibits in zoological gardens. Cranes were eaten by the ancient Egyptians, as frequently shown on funeral pictures. However, investigations in many museum collections as well as a literature survey have convinced the author that herons were not. Were herons protected in Egypt by their status as a sacred bird? Many sacred animals in ancient Egypt were mummified after death. Thousands of cats, ichneumons, falcons, crocodiles etc. have been found in such a carefully preserved state, not to mention the million mummified ibises in the catacombs of Saqqara. But no mummified herons have yet been recorded. This supposedly indicates that living herons were not kept and worshipped in temples, although they were held sacred in an abstract form (see Hopfner 1913).

Ancient man's interest in 'peculiar animals' was certainly not weaker than the interest today. Lions, bears, ostriches, etc. were captured in exotic countries to be taken to the ancient centres of culture, either for the purpose of being exhibited in zoological gardens or for being released in the hunting grounds of kings. This occurred when the original fauna around the human societies had become exterminated. Open-minded people would not neglect any opportunity to collect attractive specimens and/or impressions from nature. Concerning birds in the Near Orient, it is recorded in ancient texts that the peacock, *Pavo cristatus*, was imported into ancient Mesopotamia from the Indus lands in the 1st millennium BC (Leemans 1960). In-

deed, there are good reasons to see some kind of relation between a glorious bird in ancient Arabia and a mythologic bird in ancient Egypt.

Heliopolis was one of the places which in later times was visited by intellectuals from the new flourishing cultures, the Greek one in particular. Herodot (c. 484-420 BC) visited Heliopolis, as did Platon (c. 424-347 BC) and others. They may have brought back the Bennu myth which in Europe could have influenced the myth of Phoenix, the beautiful bird which periodic-



Fig. 13. — The Phoenix reborn from the ashes of its own funeral pyre. Hand-coloured woodcut from *Hortus Sanitatis*, a medieval encyclopedia printed at Mainz (1491). Quoting St Ambrose: « The example of this bird teaches us to believe in the Resurrection ». (Picture and text published by the British Museum [Natural History]).

ally rises from its own ashes in the freshness of youth, the symbol of resurrection. Many scholars derive Phoenix solely from the Egyptian Bennu, whereas according to van den Broek (1971:398) « it must be considered probable that the Classical phoenix myth is a purely Greek product, i.e. the Greek variant of the mythical conception of the bird of the sun found in various cultures of the Near, Middle and Far East ». Phoenix has often been pictured in an eagle-like shape (fig. 13) clearly different from the heron-like Bennu. However, a fusion of their iconography occurred in Roman Egypt (van den Broek 1971: 25). So Lactantius, in the early Middle Ages of Europe, although entitling his poem *De ave phoenice* (referred by Hubaux and Leroy 1939) more likely talked *de ave benu* when writing (in translation):

By his size he equals, bird or mammal,
The giant wader of the Arabian deserts.

THE FISHES (fig. 11.11-14)

Remains of bony fishes are considered to have been numerous among the originally discarded litter on Umm an-Nar. In the present collection they are mainly represented by the larger, more conspicuous and durable parts of the skeletal material, whereas very little remains of ribs, scales (which in bony fishes, in contrast to reptiles, are bone structures), fin rays and other fragile elements of large fishes, and hardly any bones of small fishes are preserved (see taphonomic comments earlier in the article).

Turning to the elasmobranchs, three forms have been indicated by the skeletal remains. An undetermined shark is represented by a fin spine; from the sawfish, *Pristis*, were found pieces of calcified cartilage and a number of lateral rostral teeth (which could be taken for bodkins prepared by man); and the stingray, family Trygonidae, is indicated by part of a dentated tail spine. In the living stingray the tail spine is ensheathed by a poison-producing skin layer. Even man may be seriously affected when hurt by such spine. Kingdon (1971)

refers to an example of a dugong caught dying from the spine of a stingray lodged in its body, though this case may be rather unusual. The elasmobranchs lack genuine bone material in their skeleton; they may have been eaten more frequently by the Umm an-Narians than is indicated by their few remains.

Rays, which are adapted for life at the sea bottom, are mentioned as being important 'crushing factors' in the lagoons; they feed on molluscs whose shells they crush thereby contributing to the organic part of the carbonate sediment of the region (Murray 1977).

THE MOLLUSCUS (fig. 11.15-16)

A rather large variety of species of bivalves and snails were represented in the investigated material. Judging from the number of individuals, however, they cannot have constituted an important food source for man. The *Conus* shells were sometimes used for the fabrication of buttons. The collection is under investigation.

Fragments of the interior shell of *Sepia* indicate that cuttlefish also contributed to man's diet.

COMMENTS ON THE ANCIENT CLIMATE

Among the many unsolved problems emerging from the Umm an-Nar remains of prehistoric life, one, which is closely coupled with most of the others, is about water supply. Nowadays, fresh water must be carried to the island if anybody wants to live there, except for those few and short periods of the year when rain water can be gathered. Was the climate in the 3rd millennium BC different from the present one with greater precipitation perhaps due to the greater extent of sea surface around the island than now? Were there fresh water sources below sea level in the immediate vicinity of the island, from which the precious liquid could be drawn like at Bahrain (Frifelt 1975b), or deep wells in the town which later dried out and/or sanded up? Slaves could then have supplied a pros-

perous society with its basic necessity. The soil could have been watered and allowed herbs and trees to yield delightful shadow and a variety of plant products for people and animals. There must have been water available, one way or the other!

Whether any appreciable climatic changes have occurred in the lands surrounding the Persian Gulf, and in the Indian region, within the past 5000 years is still, after many years of discussion, much in debate. The present author cannot contribute any direct information on the matter, but some indirect information can possibly be extracted from the faunal remains studied here.

Much tribute should be given to Raikes (e.g. this vol.) who continuously emphasizes the impact of man and domestic animals on vegetation and land surface development, and who maintains that present conditions (in particular in Iran and Baluchistan) are «not the result of desertisation (climate caused) but desertification (caused by misuse of delicately balanced resources by man and domestic animals)» (1977:67).

For Umm an-Nar, however, such arguments may not be adequate. The present yearly mean precipitation is so low, and the mean day temperature is so high (according to the UNESCO-FAO 'Bioclimatic map of the Mediterranean region', 1962, there are 250-300 physiologically dry days per year at present, and the mean temperature of the coldest month is above 15°C) that, unless freshwater is found not too far beneath the soil surface, only the most xerophile plants can possibly subsist. At present, one palm tree is growing on the island, and scattered small bush-like plants occur on the limestone plateau. The sabkha is infiltrated by lagoonal water and permits only growth of halophytes. (Sabkha is developed on sediments, whereas the limestone rock, which crops out in the centre of the island and which, below the sediment, is part of the mainland basement, may contain fresh ground water).

It appears that the excellent UNESCO-FAO 'Vegetation map of the Mediterranean region' (1968. Explanatory notes, 1969), which shows the potential vegetation (i.e. the vegetation disregarding the influence of man and domestic animals) for the Arabian region also, gives no explanatory notes to signature no. 73 which covers the Trucial Coast sabkha including Umm an-Nar. However, since sabkha was not yet developed on Umm

an-Nar in the 3rd millennium BC, this neglect may not be important to our present problem.

We may rather turn to Verstappen (1970) who states for the Porali Plain in Pakistan that « the less arid period... is associated with a low marine terrace that is thought to reflect the higher sea level during the post-glacial climatic optimum, some 5000 years ago » (p. 108). Assuming that the time indication is approximate and could be 'some 4000 years ago' as easily as 'some 5000 years ago', we will combine this statement with the information given earlier in this article on sea level and coastal development in the Trucial Coast region in the millennia around the habitation period of Umm an-Nar. This leads to the conclusion that climate around Umm an-Nar 4,000-5,000 years ago could have been different from the climate now. This may apply, perhaps not to the regional climate, but to the local climate at places which were environmentally sensitive to a higher sea water level, such as islands and low sites where the ground water level is influenced by the sea water level. Therefore, without colliding with Raikes' idea, the hypothesis that precipitation on Umm an-Nar was higher, and/or access to fresh water was better due to a higher ground water level at the time of the habitation of the island, appears reasonable.

Among the animals, the ovicaprine in particular give rise to reflections about water conditions. The oxen (humped, non-humped?) and the dromedaries could have been imported to the island; the gazelles were probably imported and the oryx certainly. The goats and the sheep could be supposed to have lived on Umm an-Nar. Goats and sheep are different in environmental requirements. Whereas sheep are typically grazers, goats are much less selective in the choice of food; they are generally regarded as browsers, but may also in the small towns of warm countries find a good deal of their nourishment as scavengers. The presence of sheep on Umm an-Nar suggests that vegetation was not only more prolific than it is today, but that it was more prolific than present vegetation could possibly be on the basis of present climate.

LIFE ON UMM AN-NAR

We have now developed an impression, in agreement with archaeologica (Frifelt 1975a), of an active, prosperous society with a variety of ideas, interests, food-habits etc. This settlement, as is typical in regions with a fairly stable wind direction, was located on the protected leese of the island where ships could anchor and lie on the dry bottom during low tide. Goods could have been unloaded and loaded by people coming out from the town. — The presence of ox remains on the island might call forth the idea that the goods were carried in ox-waggons. Wheeled vehicles drawn by cattle are known in the Near East from around the 4th millennium BC (Bökönyi 1976). But the oxen whose remains were found, were young animals at their climax of strength; if intended for draught, the oxen would not have been killed at that age. — Fishermen went out in their boats and came back with turtles, dugongs, birds, fishes, cuttlefish, and whatever else could be caught in the lagoons. In the market place all kinds of goods were exchanged — a monetary system had not yet come into use.

We may wonder why such a town grew up. Did it develop there because the fauna in the lagoons was so prolific? Did people settle there for reasons of protection? Or because it was more convenient to have copper exported via the desert and Umm an-Nar than to have ships sailing along the dangerous coasts of the Oman Peninsula to reach its eastern side closer to the mines? Was it one of the few places within a wide area where ships could take in fresh food and water?

Were the Umm an-Narians Arabs? Or could they have been colonists from Sumer, for instance, primarily settled there as exploiters of the area, then later developing connections with the Oman mainland and with Persian Asia? Domestic dromedaries indicate cultural connections with the Arabs; zebus point to connections with Arab lands or with Iran. Sheep and goat remains could not be identified at a specific or racial level and thus point in no particular geographic direction. The fact that no skeletal parts of dog and pig have been found does not mean that the Umm an-Narians could not have heard about them. (Both forms were domestic in, e.g., Sumer in the 3rd millennium BC, Zeuner 1963). The dog may have been present

on the island though, if it was not eaten, remains of it would perhaps not occur among the household refuse. The climate probably would not have permitted pig, domesticated in the moist riverlands, to have thrived there.

Were the Umm an-Narians dressed in homemade products: skin and wool, or did they import cloth from other regions? We do not know. (We know, however, that various kinds of garments were exported from Ur in the time of the last king of the 3rd dynasty in order to obtain copper from the region Magan. Leemans 1960: 18-19). But if camel bones were used as spindle whorls, some material (wool of sheep, goat, ?domedary) must have been spun.

These are just a small number of the questions which appear relevant to ask after having worked on the Umm an-Narian material. Perhaps a few of them will be answered one day.

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